

THE INVENTION CLAIMED IS

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1. In a wavelength router for fiber optical networking and computer interconnects, the improvement comprising:

5 at least one diffraction grating which utilizes only N wavelengths to interconnect N inputs to N outputs in a fully non-blocking manner, *wherein N is any number*

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2. The improvement of Claim 1, wherein said diffraction grating is augmented by elements selected from the group ^{*first mentioned*} of coupler and wavelength selective elements to provide fully non-blocking interconnection. *consisting*

10 3. The improvement of Claim ²~~1~~, wherein said coupler is selected from the group consisting of directional couplers and wavelength-selective couplers.

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4. The improvement of Claim 3, wherein said ^{*coupler comprises a*} wavelength-selective coupler ^{*which*} comprises an optical wavelength add-drop multiplexer.

15 5. The improvement of Claim 1, additionally including ^{*a second*} [another] diffraction grating position to receive outputs from said first mentioned diffraction grating.

6. The improvement of Claim ¹~~5~~, wherein said diffraction gratings are identical.

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7. The improvement of 6, additionally including a collection optic assembly positioned to receive outputs from said ^{*second*} [another] diffraction grating, and

a plurality of filter modules positioned to receive outputs from said collection optic assembly.

8. The improvement of Claim 7, wherein said filter modules each comprise wavelength selective add/drop filter modules.

9. The improvement of Claim 7, wherein each of said filter modules include different filters.

10. The improvement of Claim 7, wherein said plurality of filter modules comprises N-1 different filters for ^{said} N inputs and ^{said} N wavelengths, ^{wherein N is any number}

11. The improvement of Claim 5, additionally including at least one collection and re-direction optic assembly position to direct inputs to said first-mentioned diffraction grating, and a retro-reflector assembly position to receive outputs from said ^{second} ~~another~~ diffraction grating and reflect certain of said outputs back through said diffraction grating.

12. The improvement of Claim 11, wherein said collection and re-direction optic assembly additionally redirects the reflected outputs back through the diffraction grating.

13. The improvement of Claim 11, wherein said retro-reflector assembly is constructed to vertically displace and retro-reflect ^N ~~n~~ - 1 beams, ^{wherein N is any number}

14. The improvement of Claim 8, wherein said filter modules are of a 3-port type.

15. The improvement of Claim ⁴ ~~1~~, additionally including at least one coupler for combining outputs from said at least one diffraction grating.

16. A wavelength-conserving grating router for intermediate wavelength density, including:

at least one diffraction grating for receiving a number of inputs and for discharging a greater number of outputs, and

including a second diffraction grating
means for combining at least a portion of said outputs.

17. The grating router of Claim 16, wherein said means for combining at least a portion of said outputs is selected from directional couplers and wavelength-selective couplers.

18. The grating router of Claim 17, wherein said wavelength selective couplers includes optical wavelength add-drop multiplexers.

19. The grating router of Claim 16, wherein said means includes a second diffraction grating.

20. The grating router of Claim ¹⁶~~19~~ additionally including assemblies operatively connected to said diffraction gratings selected from the group consisting of collection and re-direction optic and retro-reflector assemblies, and collection optics and filter module assemblies.

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